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ABSTRACT

The National Science Foundation (NSF) Act of 1950 (as amended) authorizes and directs the foundation to initiate and support: basic research; programs to strengthen the research potential; and science, mathematics, and engineering education programs at all levels. The Division of Teacher Preparation and Enhancement supports model preservice and inservice teacher education programs, the creation of networks that provide support for teachers who are attempting to implement innovative science and mathematics programs, and a program of teacher awards. Descriptions are given of the objectives and scope of three foundation programs: teacher preparation, teacher enhancement, and science and mathematics education networks. This document provides the basic information needed to plan, develop, and submit a formal proposal for NSF grant support for each of these programs. It also provides information on how proposals are evaluated for acceptance or rejection. The appendices contain sample proposal forms with instructions for completing them. (JD)

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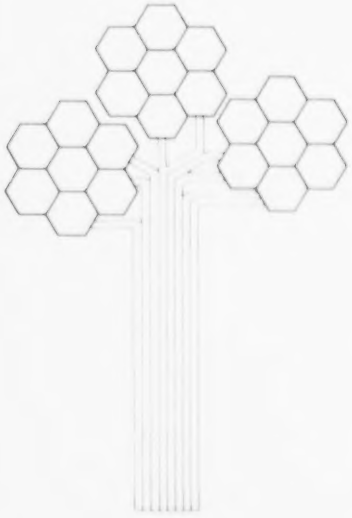

Directorate for Science and
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SP 032 574

The National Science Foundation provides awards for education and research in the sciences, mathematics, and engineering. The Foundation welcomes proposals from all qualified educators, scientists, mathematicians, and engineers, and strongly encourages women, minorities, and persons with disabilities to compete fully in the Programs described in this document.

In accordance with Federal statutes and regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, denied benefits of, or be subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

The grantee is wholly responsible for the conduct of supported research and education activities, and preparation of the results for publication. The Foundation, therefore, does not assume responsibility for such findings or their interpretation.

NSF has TDD [Telephonic Device for the Deaf] capability which enables individuals with hearing impairments to communicate with the Division of Personnel Management for information relating to NSF programs, employment, or general information. This telephone number is (202) 357-7492.

Catalog of Federal Domestic Assistance Number 47.066; Teacher Preparation and Enhancement.

Other Publications of Interest:

Program Announcements and Guidelines:

Division of Materials Development, Research and Informal Science Education (NSF 88-29); detailed information on: Instructional Materials Development; Research in Teaching and Learning; Applications of Advanced Technologies; and Informal Science Education Program.

Office of Studies and Program Assessment (NSF 88-69); information on: Studies and Analyses; and Assessment Program.

Division of Research Career Development; detailed information on: Advanced Institute Travel Awards (telephone 202/357-7536); Graduate Research Fellowships (NSF 88-57); Minority Graduate Research Fellowships (NSF 88-58); NATO Postdoctoral Fellowships in Science (NSF 88-67); and Presidential Young Investigator Awards (NSF 88-34).

Office of College Science Instrumentation; information on the College Science Instrumentation Program (NSF 88-90).

Program Solicitations:

Targeted solicitations of project proposals are issued from time to time by Offices and Divisions of the Directorate. Recent examples are:

Programs for Preparing Middle School Science and Mathematics Teachers (NSF 85-67); and Programs for Elementary School Science Instruction (NSF 86-4).

Copies of current solicitations may be requested from the office of the Directorate for Science and Engineering Education, National Science Foundation, Room 516, Washington, DC 20550; the telephone number is (202) 357-7557.

Project/Award Directories:

The Directorate publishes a variety of annual and occasional directories of awards made under the programs administered by it. Examples are:

Directory of Awards: October 1, 1983 - September 30, 1985, for the whole Directorate (NSF 86-27); and *Presidential Young Investigators 1986 Awards* (NSF 86-37; updated annually by the Division of Research Career Development).

These publications should be requested from the appropriate administrative unit within the Directorate.

General Information:

Grants for Research and Education in Science and Engineering [GRESE], (NSF 83-57, revised 3/89).

Single copies of any of these publications may be ordered from:

Forms and Publications Unit
Room 232
National Science Foundation
Washington, DC 20550

CONTENTS

I. Role of the National Science Foundation in Education 1

II. Division of Teacher Preparation and Enhancement 3

III. Programs 4

Teacher Preparation 4
Teacher Enhancement 5
Science and Mathematics Education Networks 8
Presidential Awards for Excellence in Science and Mathematics Teaching 10

IV. Preparation and Submission of Proposals 10

Who May Submit 10
When to Submit 10
What to Submit 10
Cover Page 10
Table of Contents 11
Project Summary 11
Data Sheet 11
Budget 11
Current and Pending Support 12
Results from Prior NSF Support 12
Project Description 12
Bibliography of Pertinent Literature 13
Appendices 13
Information About Principal Investigators/Project Directors 13
How and Where to Submit 13
Intergovernmental Review 13
Proposal Submission 13
Grant Administration and Final Project Report 14
Inquiries 15
Related Programs 15

V. Proposal Evaluation 15

VI. Appendices 18

1. Checklist for Proposal Assembly and Submission 18
2. Cover Page 19
3. Project Summary 20
4. Data Sheet 21
5. Summary Proposal Budget 22
6. Statement of Current and Pending Support 26
7. Information about Principal Investigators/Project Directors 27
8. Intergovernmental Review Offices 28
9. Final Project Report 33

I. ROLE OF THE NATIONAL SCIENCE FOUNDATION IN EDUCATION

The National Science Foundation Act of 1950 (as amended) authorizes and directs the Foundation to initiate and support basic research, programs to strengthen research potential, and science, mathematics, and engineering education programs at all levels. Since its inception the Foundation has funded a wide variety of projects designed to enhance the quality and effectiveness of such education in schools, colleges, and universities.

The goals of NSF's education programming are:

- to develop and to broaden the group of students who are well prepared and highly motivated to pursue careers in mathematics, engineering, and the sciences, and to improve the quality of the educational experience available to them;
- to widen the range of high-quality education offerings in mathematics, science, and technology at all levels, so that more students will be well prepared for (and thus have greater options to choose among) technically oriented careers in management and the professions; and
- to deepen the general understanding of mathematics, technology, and science by present and future citizens for life, work, and full participation in a technological society.

The Foundation will consider proposals for support of educational activities in any field of science, including but not necessarily limited to: astronomy, atmospheric sciences, biological sciences, behavioral sciences, chemistry, computer sciences, earth sciences, engineering, information science, mathematical sciences, materials science, oceanography, physics, and the social sciences. Interdisciplinary and multidisciplinary proposals also are eligible for consideration.

Because education is the responsibility of many institutions, the Foundation seeks to play a catalytic role that will enhance local efforts, bring to bear the skills and knowledge of the Nation's best scientists and educators, and engage the resources of both the public and private sectors. The Directorate for Science and Engineering Education defines and funds programs and projects that support this educational mission.

DIRECTORATE FOR SCIENCE AND ENGINEERING EDUCATION

The Directorate for Science and Engineering Education [SEE] has four major long-range goals:

- To help ensure that a high quality primary and secondary education in science and mathematics is available to every child in the United States.

  This background should provide a base for understanding by all citizens and be sufficient to enable those with the interest and talent to pursue technical careers, especially in science, mathematics, and engineering.

- To help ensure that those who select careers in science, mathematics and engineering have available the best possible professional education in their disciplines.

  SEE will concentrate its efforts on the educational structure—on the teachers, students, materials, and instructional equipment that are of critical importance through the entirety of education, formal and informal, precollege, collegiate and graduate. SEE will contribute to the research dimension of the professional education of scientists, mathematicians, and engineers, by emphasizing fellowship programs to identify the students of highest achievement and potential and support them in graduate study.

- To help ensure that opportunities are available at the college level for interested nonspecialists to broaden their science backgrounds.

  The great majority of students do not pursue technical careers and need a different kind of technical perspective to give them insights into, and knowledge of, the principles, practices, and limitations of science.

- To support science education outside the classroom, in order to encourage and maintain public interest in, and awareness of, scientific and technological developments.

The organizational structure adopted by the Directorate to address these goals through a variety of programs comprises three divisions and two offices: the Division of Teacher Preparation and Enhancement; the Office of College Science Instrumentation; the Division of Materials Development, Research and Informal Science Education; the Office of Studies and Program Assessment; and the Division of Research Career Development.

The *Division of Teacher Preparation and Enhancement* plays a leadership role in addressing persistent educational problems (such as lack of subject matter competence, the absence of adequate support systems, an inadequate reward structure, and shortages of well-prepared teachers) by supporting model preservice and inservice teacher education programs, the creation of networks that provide support

for teachers who are attempting to implement innovative science and mathematics programs, and a program of teacher awards.

Activity in the *Office of College Science Instrumentation* is devoted to improvement of the effectiveness and efficiency of laboratory instruction through the College Science Instrumentation Program. The Office supports innovative projects, large and small, to: accomplish course and curriculum revision and reform; develop new and improved instructional materials, especially including applications of new technologies; and re-think the content and organization of laboratory courses.

The *Division of Materials Development, Research and Informal Science Education* is engaged in a concerted effort to improve the quality and quantity of mathematics and science education, both in and out of school. The Division supports the development of a wide variety of instructional materials for use in formal surroundings; research on the processes of teaching and learning, to generate the knowledge and understanding essential to effective educational development; the exploration of advanced educational models and technology; and the development of a rich and stimulating environment for informal learning through such means as television and museums.

The *Office of Studies and Program Assessment* supports projects designed to provide information that will assist the Foundation in designing initiatives to strengthen science, mathematics and engineering education in the U.S. The Office also supports policy studies of national trends in science, engineering, and mathematics education, and conducts evaluations of NSF's education activities to assist the assessment of advantages and disadvantages of the program options available to the Foundation.

Through the *Division of Research Career Development*, SEE promotes the development of young scientists, mathematicians, and engineers. Its principal component is the NSF Graduate Research Fellowship Program—the Federal government's most effective means of identifying excellence in science and engineering potential among young citizens, of rewarding that excellence with national recognition and a measure of financial support, and of underscoring the importance that the Nation places on encouraging good students everywhere to consider careers in science and engineering. Within this framework, support is also provided for graduate students who are members of ethnic minority groups underrepresented in science and technology—through the award of Minority Graduate Research Fellowships.

NSF EDUCATION PROJECTS: GENERAL CONSIDERATIONS

The Foundation has unique familiarity and a special relationship with the science, mathematics, and engineering research and education communities in the Nation's laboratories, colleges, and universities, and is especially interested in fostering the involvement of members of those communities in the design and implementation of innovative education projects.

The NSF encourages partnerships in the projects it supports, including cooperative involvements among colleges and universities, local and state education agencies, cultural and professional institutions and societies, and business and industry. Such partnerships should be based on mutual interests and purposes, with all partners sharing not only in financing, but in the development, implementation, and followup activities growing out of the collaboration.

The Foundation seeks leveraged application of its resources and is strongly committed to the principle of cost sharing in its projects, both as evidence of importance to the proposing institution, and as an indication of continuing commitment and long-term impact. Cost sharing by collaborating partners is required in some programs and strongly encouraged in all others—especially when its goals include continuation and maintenance of project activities by local institutions or self-sustaining networks after NSF funding terminates. Since it takes substantial time to develop meaningful collaboration, projects that have small initial contribution from such partnerships, but present a well-developed plan to organize them and phase out the NSF share of project costs, are encouraged also.

The National Science Foundation is strongly concerned about the underrepresentation of women, minorities and the physically disabled in careers in mathematics, engineering, and the sciences. Projects involving members of these groups as principal investigators or staff, or as the target audience, are especially invited. NSF is particularly interested in projects designed to test new approaches to increasing the numbers of students in such groups who are motivated to prepare themselves for careers in mathematics, science and engineering.

The program descriptions in this announcement are guidelines to help those who are developing proposals for submission to NSF to sharpen their focus. The individual programs are well-defined, but all are sufficiently flexible to be receptive to new ideas in the context of the agency's mission to support efforts to strengthen science education at all levels.

All of the Foundation's directorates are involved in education activities. Innovative projects with unusual or creative designs, or projects that cut across NSF's organizational boundaries to address a problem effectively and efficiently, are welcome. In such cases, proposers are urged to submit preliminary inquiries and/or to contact NSF staff to assess the appropriateness of the project or to determine the unit to which the proposal should be submitted.

The staff of the Directorate for Science and Engineering Education is available for advice and counsel as ideas and proposals are being developed. Selection of individual projects for NSF support is based on excellence, and the evaluation of educational and scientific merit is based on peer review.

II. DIVISION OF TEACHER PREPARATION AND ENHANCEMENT

The National Science Board Commission on Precollege Education in Mathematics, Science and Technology has stated that a primary national goal should be to strengthen elementary and secondary science and mathematics education to provide all the Nation's youth with a level of education that is both the highest quality attained anywhere in the world and reflects the particular and peculiar needs of our Nation.

Since most people acquire their basic science education in grades kindergarten through twelve, strong elementary and secondary education in mathematics, science, and technology is essential. For citizens who do not pursue postsecondary study, what is learned at precollege levels is crucial. For students pursuing nontechnical careers as well as students preparing for careers as engineers, mathematicians, scientists, and science educators, college and university programs build upon and extend this early development.

In response to these needs, *the Foundation is focusing especially on projects that will strengthen science and mathematics education for students at the middle/junior high school and elementary level,* although proposals relating to the high school years are still welcome. Both public and private school teachers are eligible to participate in NSF-supported projects.

Persons interested in seeking NSF support for new teacher education concepts will find Foundation staff members eager to share information about the successes and failures of past projects and features common to all highly rated proposals. Inexperienced project designers will also discover that teachers, chosen from the classrooms targeted for improvement by the project, can provide valuable advice and assistance.

Teachers are obviously central to education. They serve as models, motivators, and mentors—the catalysts of the learning process. Moreover, teachers are agents for developing, exchanging, and replicating effective teaching materials and methods. For these reasons, education in mathematics, science, and technology can be strengthened only if teachers are adequately prepared, highly motivated, and appropriately recognized and rewarded.

In attempting to achieve these goals, the Foundation has a dual strategy. It seeks to support well-designed projects that will directly benefit the teacher/participants by making them more competent in the subject matter, more comfortable in its presentation, and more committed to their profession and their pupils. Such anticipated outcomes are necessary for a successful project, but they are not sufficient. The Foundation expects that projects should add to the base of knowledge about how teachers can most effectively be prepared and subsequently aided to enhance their capabilities. A project that achieves the goal of aiding individual teachers (and, indirectly, their students) can also serve as an exemplar for other projects, thus broadly improving the quality of science and mathematics teaching.

The Division of Teacher Preparation and Enhancement supports projects that promote these objectives while adding to our knowledge about activities that prepare teachers in the content and the teaching methods that promote effective learning by students at each school level; enrich teachers' expertise for professional leadership and peer teaching; provide encouragement and opportunities for teachers to enhance and develop their capabilities; and provide dissemination opportunities that actively involve elementary, secondary, and college teachers in exchanging ideas that improve their own teaching.

In pursuit of this knowledge, the Division of Teacher Preparation and Enhancement encourages projects that:

- capitalize on the prestige associated with an NSF grant and exploit the Foundation's unique familiarity and relationship with the scientific research and education community;
- stimulate collaboration among such partners as the Federal government, colleges and universities, state and local education agencies, business and industry, cultural institutions and media, scientists and science educators, and teachers, school administrators, and parents;
- result in self-sustaining networks among these varied elements—cooperative patterns that will continue to function, supported by non-NSF funds; and
- focus resources, exert high leverage, and are widely applicable approaches to strengthening science and mathematics education.

Projects should include the formulation, testing, and refining of non-routine approaches to the problems being addressed. A rationale should identify critical factors of the problem under study and the approaches expected to produce the desired effects. A working model embodying these factors and approaches should be clearly discussed in the proposal. As the model is implemented, it should be carefully studied. Proposals should identify appropriate indicators and present plans to *assess* the effects of the project activities upon participants and systems. Final project reports should provide the NSF and the science community documentation of the functioning of the model in terms of events occurring during the project activities and in the classrooms of the participants at later times.

Several key questions are important in developing a project: What will be learned about strengthening school science and mathematics education, and how is this knowledge to be discovered? How might this knowledge help others involved in teacher preparation, teacher enhancement, or

network activities? How will this knowledge be disseminated to those who might benefit from it?

The Foundation encourages partnerships in the educational projects it supports. These collaborations might well include science and teacher education faculties, school administrators, supervisors, teachers, parents and other interested citizens. The Foundation is also committed to the principle of cost sharing among project partners, with the goal of continuation and maintenance of project activities by local institutions after NSF funding terminates. Cost sharing may involve in-kind contributions such as released time, space, equipment, computer time, and personnel, as well as financial contributions.

The program descriptions in this announcement are guidelines to help those who are developing proposals to present their ideas and supporting information in the format and detail necessary for the review and evaluation process. The staff of the Directorate for Science and Engineering Education is available for advice and counsel as ideas and proposals are being developed.

III. PROGRAMS

TEACHER PREPARATION

Objectives of the Program

This program supports the development of innovative new programs for the preservice preparation of science and mathematics teachers, research on factors affecting the teacher preparation process, and the development of creative new materials to support teacher education. Thus, the program seeks to achieve the following goals:

- Stimulate a re-examination of the teacher preparation process.
- Catalyze the generation of models for the preservice preparation of science and mathematics teachers that could be replicated widely throughout the Nation.
- Broaden the knowledge base about the preparation of effective science and mathematics teachers.

Such activities will ultimately lead to:

- programs that will prepare teachers who are strong in content knowledge; pedagogical knowledge and skills, and the use of advanced technologies in instruction;
- innovative teacher preparation programs that integrate research on teaching and learning with content and pedagogical knowledge;
- linkages among scientists, science educators, education specialists, school personnel, and other participants in the teacher preparation process; and
- the attraction of more individuals of high ability in science and mathematics to the teaching profession, particularly women at the secondary level and minorities and physically disabled at all levels.

Scope of the Program

Appropriate project activities include, but are not limited to, the following:

- The development and evaluation of innovative undergraduate programs for the preparation of future teachers of science and/or mathematics in the elementary, middle/junior high, or high schools.
- The development and evaluation of courses, materials, or software that strengthen the preservice preparation of teachers by addressing areas of weakness in current programs relative to basic knowledge in science, mathematics and technology, and/or effective methods for teaching and learning those subjects.
- The development and evaluation of innovative experiences for preservice or beginning teachers that will improve their effectiveness as teachers and will facilitate their induction into the profession.
- The development and evaluation of recruitment and retention strategies for attracting and retaining talented students, particularly members of under-represented populations, in teacher preparation programs.
- Research on effective strategies relative to the preservice preparation of teachers and their induction into the profession.
- The development and evaluation of programs designed to address new or emerging teacher certifications in science or mathematics.

Characteristics of Teacher Preparation Projects

In addition to addressing the general objectives described above, projects should have the following characteristics:

- Emphasize a broad and solid foundation in science or mathematics content appropriate for teachers at the grade levels for which they are being prepared.
- Assure rigorous preparation in effective methods of teaching science or mathematics based on an explicit set of assumptions about teaching effectiveness.

- Integrate the use of appropriate advanced technologies throughout the preparation experience.
- Include, on the project team, scientists who are experts in the content of the relevant disciplines and educators familiar with research on learning and with school environments at relevant levels. Collaboration with school personnel is strongly encouraged.
- Evaluate the program's or materials' short- and long-term effectiveness including teacher behaviors, student achievement, and other meaningful outcomes.
- Result in a program or product capable of being sustained or used without continuing Foundation support, and suitable for widespread adoption or adaptation by other teacher preparation institutions.

Proposals should describe in detail the rationale for the project's approach to the preparation of teachers, plans for the development and evaluation of the program or materials, qualifications of the staff, mechanisms of implementation, and methods for assessing the effectiveness of the project and for disseminating the results. The narrative describing the content and format of the proposed program or materials should be sufficiently detailed to enable reviewers to judge the project's scientific merit and its potential for preparing effective teachers of science and mathematics.

Projects may request funding for the development and evaluation of programs and materials or for research on teacher preparation. Operational costs such as instructional/supervisory costs, student support, or costs for the large-scale publication of materials should not be requested. Institutional cost sharing is encouraged as well as contributions from, and collaborations among, business, industry, and education agencies. It is desirable for negotiations with potential publishers to be already underway in a large-scale materials development project. Preliminary planning, needs assessments, or material/literature reviews should be completed prior to the submission of a proposal and should be described in the proposal.

Target Dates and Preliminary Inquiries

Proposals for this program are evaluated by peer reviewers through a mail review followed by a panel meeting. The following target dates for receipt of proposals should be observed; proposals received at NSF after a target date will be held for the panel review conducted after the next target date:

- October 15 for projects beginning in the following Summer or Fall;
- April 15 for projects beginning in the following Winter or Spring.

Brief preliminary inquiries (three copies, 5-8 double-spaced pages) are encouraged but not required. The preliminary inquiry process provides an opportunity for the proposer to receive comments from the Foundation staff on the appropriateness of the project's focus and any potential weaknesses or omissions. Preliminary inquiries and staff opinions have no bearing on the peer review process for a formal proposal. Preliminary inquiries should be submitted at least three months prior to the anticipated date of proposal submission, directly to:

Director, Teacher Preparation Program
Division of Teacher Preparation and Enhancement
Directorate for Science and Engineering Education
National Science Foundation
Washington, DC 20550

TEACHER ENHANCEMENT

Objectives of the Program

This program seeks to improve the quality of instruction in science and mathematics by supporting programs designed to enhance teacher effectiveness while serving as prototypes for other inservice projects. The specific objectives include the following:

- Stimulate the construction, investigation, documentation and refinement of effective approaches and creative materials for the continuing education of elementary, middle/junior high and high school mathematics and science teachers.
- Provide teacher participants with opportunities to learn disciplinary concepts and processes and effective teaching methods.
- Identify outstanding classroom teachers who will develop leadership skills to assist in improving the teaching practices of their less well-prepared colleagues.
- Identify less well-prepared classroom teachers with demonstrated needs and expressed commitments to pursue professional development with the goal of improving their competence for effective teaching.
- Support planned opportunities for teachers to share and work together in local and/or regional settings to improve their own teaching under the continued guidance of the project staff.
- Provide incentives to establish continuing collaborative partnerships among faculties of schools, colleges and universities, and personnel from a variety of public and private organizations.
- Help to attract the most talented individuals into education, giving special attention to increasing access to careers in science, mathematics, and technology for currently underrepresented populations.

Scope of the Program

The Teacher Enhancement Program recognizes the need for elementary and secondary school science and mathematics

teachers to continue their professional development and to renew their professional commitments.

- Teachers need to have significant collegial relationships which allow them to share classroom experiences and ideas with others in ways that nurture lasting professional partnerships.
- Teachers must continuously construct and reconstruct the theoretical and practical bases for their teaching. Updating and deepening content and pedagogical knowledge is basic to a teacher's professional growth, and requires correct and current information. Such renewal is fundamental to the improvement of one's own teaching strategies and to the "ownership" of one's curriculum.
- Teachers need stimulation and guidance in shifting their teaching practices toward problem-solving approaches and constructive methods sensitive to the development of their individual students.

This Program recognizes a need for educators concerned with school science and mathematics teaching to formulate and investigate effective means for helping elementary and secondary teachers improve their conceptual understanding and classroom practice. Therefore, projects which develop model approaches and/or materials designed to improve both well-prepared and less well-prepared teachers are especially sought. Effective projects will:

- seek improvement in both the subject matter knowledge and classroom practices of the teacher participants,
- analyze, interpret and report the characteristics of the approaches taken in providing learning experiences for the teachers, and
- assess and document the nature and extent of changes caused by the project.

Appropriate activities for participating teachers may include, but are not limited to, courses, workshops, seminars, research participation, or structured leaves-of-absence designed to:

- expand participants' knowledge of concepts and processes in science, mathematics and technology,
- deepen participants' knowledge and application of improved teaching methods, with special emphasis upon increasing their effective use of the laboratory in teaching science and a problem-solving focus in teaching mathematics,
- increase teacher and school effectiveness in reaching traditionally less interested groups of students, including females, minorities, and the disabled, and
- increase the potential impact that the project participants may have upon the improvement of science and mathematics programs in schools.

Characteristics of Teacher Enhancement Projects

If science and mathematics teaching is to improve substantially, we must increase our understanding of the intellectual, attitudinal, and situational factors which influence teachers' practices—as well as the intervention factors which may be most influential in helping teachers to improve. Such understanding can provide a principal basis for the design and implementation of effective teacher development strategies. An important aspect of the Foundation's role in teacher enhancement is to stimulate and support projects from which such increased understandings result. In conceptualizing a model project the following elements should be considered:

- Creative approaches to the continuing education of teachers are needed to help teachers improve their professional self-concept, subject matter understanding, and pedagogical practice. In a proposal, the approach to teacher enhancement should be formulated in terms of activities which are hypothesized to influence teaching practices. These should be clearly presented in the rationale for the model.
- Evaluation of the model may prove difficult, but it is essential. Proposals should present clear plans for assessing the effects of the project activities upon participants and schools. Appropriate indicators should be identified which will yield significant information about the effectiveness of the approach with the participants.
- Clear documentation of the functioning of the project activities should be presented in the Final Project Report. In some cases, statistical analyses may be appropriate; in others, observations and anecdotes may be more meaningful. The Foundation will be particularly interested in new insights about educating teachers and in mechanisms for other scientists and educators to learn enough about the model to replicate its successful features. [Additional guidelines concerning the Final Project Report are given below.]

Project Planning. Thorough planning of all aspects of the proposed project should be completed and documented in the proposal. The following aspects should be carefully considered in formulating an effective project:

- Effective project planning will involve classroom teachers from the target population who have the appropriate expertise and background. As appropriate, the project staff should include subject matter scholars, teacher educators, educational researchers, curriculum developers, school supervisors, and classroom teachers.
- Projects should be designed to address specific local or regional problems or needs which have generalizable, possibly national, implications. Evidence for such needs should be cited and the proposed model ap-

proach should be related to these needs. Project activities should address the Foundation's commitment to providing greater access of underrepresented groups to science, mathematics, and engineering.

- Effective projects will provide hands-on sessions for teachers to experience, in depth, the concepts and processes under consideration. Teachers should have opportunities to work with the best available instructional materials, educational technology, and teaching methods. Results of research on teaching and learning that might have an impact on instruction should be incorporated. However, project leaders should recognize that it is essential to have school support if new methods and/or materials are to be implemented in the classroom.
- Participants should have project time and staff assistance to plan their own classroom uses of the subject matter concepts, teaching methods, and curriculum materials. They should have opportunities to share ideas for these implementations with other project teachers.
- Effective projects will provide continuing support of the teachers after they return to their classrooms. Activities could include classroom visits and observations by project staff to encourage and advise participants as they implement project activities and as they work with their colleagues in the outreach phases of the project.
- Commitments of support from local school administrators should be obtained and documented in the proposal. These commitments might include willingness to effect changes in teaching methods and materials, to provide released time for the teachers who are to implement the changes, or to approve a new pattern of teaching assignments and student activities (e.g., laboratory sessions, projects, field trips).

Participants. Public and private school teachers of sciences and/or mathematics at all levels—elementary, middle and high school—are eligible for participation in Teacher Enhancement projects. Projects should address the need to stimulate, renew and retain our most successful "master" teachers as well as the need to upgrade and assist the marginally successful (possibly uncertified) teachers. Although support can be requested for projects that focus on one group or the other, proposals involving members of both groups, working together, are especially sought. Highly-qualified teachers can provide significant assistance to their less well-prepared colleagues. On the other hand, proposers should be aware that extreme heterogeneity in teachers' backgrounds can present major difficulties as well as opportunities.

Effective projects involving *well-prepared teachers* will:

- select participants with demonstrated capacity and willingness to help colleagues needing instructional assistance,
- provide appropriate enhancement experiences to update and renew the subject matter and pedagogical expertise of the leadership teachers,
- engage them in experiences designed to prepare them to assume helping roles with their less well-prepared peers in their home or area schools,
- identify specific teacher colleagues who agree to participate in targeted self-improvement activities with the leadership teacher, and
- assist in establishing and maintaining the commitments of their home school system to support their continuing leadership efforts.

Many teachers with inadequate or out-dated preparation are involved in teaching science and mathematics. Effective projects involving such *less well-prepared teachers* will:

- select participants with demonstrated needs and expressed commitments to pursue intensive study of subject matter content and teaching methods with the goal to improve their classroom performance,
- engage them in appropriate professional studies of content and pedagogy designed to exert substantial influence upon their understanding, attitude and classroom practice,
- provide workshop experiences in which each teacher participates in learning activities organized to foster a collaborative approach with colleagues (possibly leadership teachers), and
- assist in establishing and maintaining school commitments to support the teachers in continued professional growth through implementations of project ideas in their own classrooms.

Participant *selection criteria and processes* should be clearly specified in the proposal. Project goals and activities should reflect the needs and qualifications of the teachers to be served. Specific assurances should be given that participation of women, minorities, and disabled persons will be encouraged.

Target Dates for Proposal Submission

Proposals for this program are evaluated by a combination of mail and panel peer review followed by review analysis. The following target dates for receipt of proposals should be observed; proposals received at NSF after a target date will be held for the panel review conducted after the next target date:

- February 1 for projects with possible award periods to begin no earlier than August 1 of the calendar year.

This target date includes workshops that begin during the academic year.

- August 1 for projects with possible award periods to begin no earlier than February 1 of the following calendar year. This target date includes workshops to begin during the following summer.

SCIENCE AND MATHEMATICS EDUCATION NETWORKS

Objectives of the Program

This program promotes the creation, evaluation, and exploitation of local, regional, or national networks designed to share information or disseminate resource materials relating to the teaching and learning of mathematics and science. Its goals are as follows:

- Stimulate the development, assessment and documentation of model approaches that demonstrate effective strategies for disseminating information and resource materials. Both the networks created and the materials disseminated should have significant impact on elementary and secondary science and mathematics education.
- Promote meaningful sharing of ideas, resources, and human talent through ongoing collaborations that may include, among others, teachers, parents, and other concerned persons from schools, local and state education agencies, colleges and universities, business and industry, and cultural and professional organizations.
- Build bridges between educational product developers and users, including teachers and local and state agencies responsible for selecting instructional materials. Such networks should help authors, publishers, and other producers of such materials to be more effective in meeting pedagogical needs.
- Encourage the development of resource-sharing activities of networks, possibly augmented by effective and appropriate use of video, computers, and telecommunications, that will serve the needs of local school districts and will continue after NSF support has terminated.

Scope of the Program

The Networks Program is predicated on the belief that more effective sharing of human, informational, and material resources can make substantial improvements in elementary and secondary science and mathematics education. Projects should involve continuing cooperative activities that can produce the desired improvements.

The Networks Program is especially interested in new ideas that may be replicable, may trigger the development of beneficial projects elsewhere and may provide new information about effective strategies for sharing and use of resources. Many different modes of collaboration are possible, and examples suggested here should not limit the creativity of proposers. Projects may provide for the following:

- Dissemination of useful information through existing networks.
- Establishment of working relationships among administrators, teachers, parents, and community leaders to solve particular educational problems.
- Workshops for building partnership teams to work collaboratively on specific educational problems.
- Working conferences leading to new activities and lasting partnerships.
- Design and assessment of new strategies for effective and efficient dissemination of information or resources.
- Utilization of telecommunications or computer networks for worthwhile projects.

In general, conferences will be supported only if strong follow-up is included, such as when the conference is part of establishing ongoing collaborative efforts. To be supported, conferences should be designed to have clearly defined, beneficial effects on the teaching of science and mathematics. The publication of conference proceedings is not usually a sufficient follow-up activity to warrant NSF support.

Characteristics of Networks Projects

Projects submitted to this Program should consider the following elements:

- The approach to be taken in the proposed activities should be presented clearly and concisely. The rationale for the model should be made explicit in terms of the results of the needs assessment, the goals to be sought, and the proposed activities.
- As the activities are conducted, the impact and effect of the approach should be carefully studied. Proposals should include specific plans for assessing the consequences of the activities, including attention to the cost-effectiveness of the approach. Consideration should be given to how formative results could help improve the project as it is in progress. Elaborate schemes for evaluation are unnecessary. Oftentimes, a direct, practical plan that can provide valid, sensitive indicators of results may be most effective.
- Completed projects should seek to return to NSF and the science community clear documentation of the conduct of the activities and their consequences. Plans for this detailed documentation should be presented in the proposal.

Project Planning. Thorough planning of all aspects of the proposed activity should be completed and documented.

- Existing network organizations, consortia and institutions (local and state education agencies, colleges and universities, business and industry, professional societies and cultural agencies) are likely proposers.
- An assessment of needs and problems should be completed before submitting the proposal. The results of the assessment should lead to defining the particular problems to be addressed and to designing approaches to addressing the needs and problems.
- Effective project planning will actively involve members of the target groups to assure that the most significant needs are identified and that the approaches to be taken in the activities reflect the interests and capabilities of the target group.
- The content of project activities should be selected from the vast array of curriculum materials, teaching practices, research findings, and instructional technologies currently available for teaching mathematics and science. Proposers must ensure that the ideas and items to be disseminated are of high quality, meet well-defined needs, and will substantially improve education in the target areas.
- The scope, nature and structure of the follow-up components of Networks projects are of central importance. This structure should be designed to promote and establish continuing relationships and subsequent activities that promise to have a substantial impact on science and mathematics education.
- Well-qualified staff are important to the success of a project. The proposal should describe the qualifications of the Principal Investigator(s) and staff, especially emphasizing those aspects that are relevant to carrying out the proposed activity.
- Cost-sharing and continuation of the project after NSF funding should be considered in the proposal. A proposal is strengthened by evidence of real cost-sharing and scheduled phasing-out of NSF support. A realistic plan should be developed for continuation of the project after NSF funding. This plan should be substantiated by letters of commitment from relevant support sources.

Participants. A wide variety of individuals is eligible for participation in Networks projects.

- Proposers must keep in mind that the focus will be upon those activities which directly influence teaching and therefore learning practices. Thus, it is desirable that elementary and secondary science and mathematics teachers be included as project participants. The criteria for selection of all participants must reflect project goals and strategies.
- Expectations of what participants and their institutions might contribute to, and gain from, the activities should be clearly stated. These should serve as the basis for specifying the criteria for selection of participants.
- Firm commitments from key individuals and/or groups involved in the project help assure that its effects will eventually reach the student learner. Such commitments may involve financial support, resources or services. The stronger the cost-sharing commitments, the less likely that important components of the project will be left to chance.
- The Networks Program is particularly interested in projects designed to increase the numbers of women, minorities, and physically disabled persons who are encouraged to study, and to consider careers in, science, mathematics, and technology.

Proposal Submission

The staff of the Science and Mathematics Education Networks Program strongly recommends that proposers submit a preliminary inquiry before submitting a formal proposal. The preliminary inquiry process is not elaborate, and it provides an opportunity for proposers to explore ideas with Foundation staff without commitment on the part of either and without the large investment of time and effort required by a formal proposal. The inquiries should be no longer than five single-spaced pages and should address the following topics:

- What are the needs and how were they assessed?
- What, in broad outline, is the project and how will it meet the assessed needs?
- What are the expected outcomes?
- Who will carry out the work and what groups will be part of the network?
- What evaluation will be done to determine if the outcomes have been achieved?
- What are the approximate costs for the project and what cost-sharing is planned?

Preliminary inquiries and staff opinions have no bearing on the peer review process for a formal proposal. No information concerning the preliminary inquiry is available to peer reviewers.

There are no specific target dates for the Science and Mathematics Education Networks Program. Preliminary inquiries or formal proposals may be submitted at any time. Every effort will be made to respond to preliminary proposals within four weeks of their receipt. Formal proposals will be acted upon within six months of their receipt. Three copies of any preliminary inquiry should be sent directly to:

Science and Mathematics Education Networks Program
Division of Teacher Preparation and Enhancement
Directorate for Science and Engineering Education
National Science Foundation
Washington, DC 20550

[**PLEASE NOTE**: Only preliminary inquiries are to be sent directly to the Division. As described in Section IV, formal proposals must be addressed to the Data Support Services Section of the Foundation.]

PRESIDENTIAL AWARDS FOR EXCELLENCE IN SCIENCE AND MATHEMATICS TEACHING

This is an initiative of the Office of the President of the United States to provide national recognition for distinguished middle and secondary school teachers of science and mathematics. Teachers eligible for this award are those whose primary responsibility is classroom teaching of science or mathematics in a public or private middle/junior or senior high school in each of the fifty states, District of Columbia, Puerto Rico, Department of Defense Dependents Schools, or the group of U.S. Territories (Guam, American Samoa, The Commonwealth of Northern Marianas, and the Virgin Islands). A minimum of five years teaching experience in science or mathematics is required.

Awardees receive national recognition and their schools each receive a two-year $5000 NSF grant to be used, under the direction of the awardee, for improving the science or mathematics instructional programs in their school districts. The involvement of these nationally recognized teachers in leadership activities to promote and improve science and mathematics education is encouraged. [This description is provided for informational purposes only. No application or proposal is sought for Presidential Awards via this announcement.]

IV. PREPARATION AND SUBMISSION OF PROPOSALS

This announcement provides basic information needed to plan, develop, and submit a formal proposal. More detailed information is available in the publication *Grants for Research and Education in Science and Engineering* [GRESE], NSF 83-57, revised 1/87.) This publication is available from the Forms and Publications Unit, Room 232, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550.

Appropriate administrative officials of the applicant's institution must be familiar with the policies and procedures contained in the *NSF Grant Policy Manual, Revised*, NSF 77-47. If the submitting organization has never been a recipient of an NSF award, the cognizant program officer will request that one free copy of the *Manual* be sent to the institution. [Additional copies of the *Manual* may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.] If a proposal is recommended for an award, the NSF Division of Grants and Contracts will request certain organizational, management, and financial information. These requirements are contained in Chapter III of the *Manual*.

Who May Submit

Organizations with a scientific or educational mission are eligible to submit proposals. Among these are: colleges and universities; state, regional, and local education agencies, including school systems; professional societies; science museums and zoological parks; research laboratories; private foundations; private industry; and other public and private organizations, whether for profit or non-profit. Proposers are encouraged to involve interdisciplinary representation and possibly a consortium of organizations.

When to Submit

Program	*Preliminary Proposals*	*Target Date*	*Earliest Award Date*
Teacher Preparation	Accepted at any time	October 15 April 15	April 15 October 15
Teacher Enhancement	Accepted at any time	February 1 August 1	August 1 February 1
Science & Mathematics Education Networks	Strongly recommended at any time	None stated; submit at any time	Six months after receipt

Proposals must be received at NSF by 5:00 p.m. on the target date (or, if the date falls on a weekend, on the *preceding* Friday). Although proposals are accepted at any time, all proposals received after a particular target date will be held for the panel review conducted after the next designated target date.

What to Submit

Proposals should be prepared in accordance with these guidelines. Fifteen (15) copies of the proposal and three (3) additional copies of the Cover Page, Project Summary, and Data Sheet are required. *Use the following ordering of sections to assemble the proposal:*

Cover Page

Use photocopies of the Cover Page form, Appendix 2. In the upper left block identify from the listing below the specific program to which the proposal is submitted:

Teacher Preparation
Teacher Enhancement
Science and Mathematics Education Networks

For proposals that may involve more than one program, prior discussion with NSF staff should be held to determine the appropriate program to which the proposal should be submitted. If, after receipt of the proposal, staff examination suggests that it would be more appropriately considered in a program other than the one to which it has been submitted, the principal investigator will be contacted to determine whether the change is acceptable.

Originals of all required signatures [principal investigator, co-principal investigator, and organizational representatives] with dates must appear in the appropriate locations on the Cover Page of one *signature copy* of the proposal.

Table of Contents

The Table of Contents should list the page location of all sections identified below and all appropriate subsections, including the contents of the Appendices.

Project Summary

Use the form in Appendix 3 to provide a required 200-word summary, as well as the rest of the information requested on that form. The summary should be understandable by an intelligent, non-specialist reader and should be free of jargon and technical terminology that would obscure its meaning. Indicate what is going to be done, why, by whom, when, how many will be affected, and the desired outcomes.

Data Sheet

The Data Sheet from Appendix 4 must be completed carefully to identify key information about the proposed project. Instructions are on the reverse side of the Data Sheet.

Budget

A budget for each year of support requested, as well as a cumulative budget for the full term of the project, must be presented. Use photocopies of the Summary Proposal Budget sheet from Appendix 5 (NSF Form 1030); please note the instructions presented on the back page of the form. Clearly label each copy of Form 1030 at the top (e.g., Cumulative, Year 1, etc.). All budgets must be cost effective with specific requests clearly documented and justified. Attach budget explanation sheets to the Form 1030 for each year; these need not be repeated for the cumulative budget. Label the items in the explanations to match the items found on the Form 1030. Information related to particular items follows:

Items A & B. Personnel. Requests for support of project staff should be reasonable with respect to the activities proposed. Estimates of time in person-months should be justified in terms of the tasks to be performed. At most, two summer months per person may be requested. Time for project administration and planning, per se, should be minimal. However, in inservice projects sufficient time should be planned for completing detailed followup and support activities with teachers in schools and for the careful documentation and assessment aspects of the project.

Item D. Permanent Equipment. In general, monies to purchase equipment should not be requested. Institutions conducting instructional programs are expected to be able to provide the necessary laboratory, computing, etc. devices for use by staff and participants. In the case of equipment to be used by participants in their home schools it is expected that state and local funds will be available to support and maintain needed items. If proposers are unsure of the appropriateness of equipment requests, they are encouraged to contact NSF program staff.

Item E. Travel. When necessary to promote project goals, support of staff travel to provide services to participants and for the conduct of other project activities is provided. Travel can be approved to a national meeting for purposes of the PI/PD (or a representative of the project) disseminating information about the project if justified, subject to these considerations: it is a meeting for which institutional support is not normally available and at which an appropriate significant audience not normally contacted will be reached. More cost-effective means of disseminating project information should be carefully considered in view of the high costs and nominal impacts which can occur through travel to national meetings.

Item F. Participant Support Costs. Funds to defray participant costs may be requested from NSF or included as a cost-sharing contribution. However, no NSF funds may be requested for participants in Teacher Preparation projects or for elementary and secondary school students. In the case of Teacher Enhancement or Networks projects, support may be requested for inservice participants.

Item 1. A direct stipend to participants is encouraged. Up to $40 per day ($200 per week) for full-time project activity is allowable from NSF funds. The amount of the total stipend may exceed these amounts if supplemented by monies from other sources. [**NOTE:** Funds for participant stipends may be available through Title II of the Education for Economic Security Act. For more information, proposers are encouraged to contact the appropriate State Coordinator for Elementary and Secondary Education for Title II: Education for Economic Security.]

Item 2. Costs for participant travel should be limited to one round trip from home to and from the project site, except for commuting participants who may be reimbursed for actual travel at approved rates.

Item 3. Costs for participant room and board may be requested. Teachers should be provided with sub-

sistence support comparable to other professionals working in the project.

Item 4. Among the other eligible costs, tuition fees may be requested if no NSF funds are used to support the instruction. If NSF funds are requested for supporting instructional staff salaries, then NSF monies may not be requested for tuition costs and a tuition waiver may not be counted as an institutional cost-sharing contribution to the project.

Item G. Other Direct Costs. Reasonable expenses associated with these items for the conduct of the project should be included as requests from NSF or as cost-sharing contributions. The Foundation has policies guiding support of consultant services; contact NSF staff for current information.

The financial aspects of cost-sharing and joint or cooperative funding by members of a partnership formed for the purposes of the proposal should be shown in a detailed budget for each party. These budgets should reflect the arrangements and agreements among the parties, and should show exactly what cost-sharing is proposed for each budget item. Cost-sharing must be in categories that are eligible for Foundation funding in these programs; for example, instructional salaries and supplies are eligible, whereas capital expenditures for office equipment are not.

Any fee proposed to be paid to a collaborating or "partner" for-profit entity should be indicated. (Fees will be negotiated by the Division of Grants and Contracts in consultation with the Program.) Any copyright, patent and royalty agreements (proposed or in effect) must be described in detail, so that the rights and responsibilities of each party are made clear. If any part of the project is to be subcontracted, a budget and work plan prepared and duly signed by the subcontractor must be submitted as part of the overall proposal and addressed in its narrative.

Item I. Indirect Costs. Institutions which have not previously received a Federal grant will need to complete certain negotiations, including determination of an indirect cost rate. Proposers are encouraged to contact the Division of Grants and Contracts (202/357-9626) for additional information.

Current and Pending Support

See Appendix 6 for the appropriate form. All support for research and education projects that occupy the time of the Principal Investigator(s) must be included. Footnotes may be necessary to explain your activities and their support. This form is applicable to all supported projects, including those pending approval. Failure to include this form can slow up an award action.

Results from Prior NSF Support

To enable NSF staff and reviewers to evaluate performance on prior NSF awards, applicants are required to describe results from prior NSF support in a separate section of the proposal. Failure to include this section will delay review of the proposal until it is received.

If the Principal Investigator(s) has received an NSF award in the past five years, information on the prior award is required:

1. The NSF award number, amount and period of support.
2. The title of the project.
3. A summary of the results of the completed work. (This summary should not exceed in length the equivalent of four single-spaced pages.)
4. List of publications resulting from and acknowledging the NSF award.
5. If the proposal is a renewal of a grant, then describe the relation of the completed work to the proposed work.

If the applicant has received multiple prior awards (amendments to an award are not considered separate awards), the applicant should provide the information requested for the *one* prior award that is most closely related to the proposal. Peer reviewers will be asked to comment on the quality of the prior work described in this section of the proposal.

Project Description

The main body of the proposal should be a detailed, but concise, statement of the project to be carried out. The project description *should not exceed 15 single-spaced pages* [the equivalent of 30 double-spaced pages is acceptable]. The description can be amplified by material in appendices [which also may not exceed the equivalent of 15 single-spaced pages], but the main body of the proposal should present a complete description of the project. Use the suggested proposal evaluation criteria of Section IV to determine details that need to be provided to facilitate review.

The project description should discuss the particular needs to be met by the project, and how these were determined. Provide a rationale for the approach to be taken, emphasizing key factors and include a detailed description of the project activities. A schedule of activities, workshop plans, course outlines, meeting agenda, followup activities, etc. should be discussed in sufficient detail to communicate the scientific and educational merit of the content and processes involved. Inclusion of a timetable of project activities and personnel time commitments is strongly encouraged.

Describe the administrative mechanisms that will be used to organize and manage the project. Any partnership, consultant, or subcontract arrangements should be described and the rights and responsibilities of each party set forth clearly. Cost-sharing, cooperative funding, and other financial arrangements should be described. Potential income producing aspects of the project should be indicated.

It is expected that all projects will conduct thorough, appropriate assessment and documentation activities in order

to return to the Foundation information that will be useful in understanding the project and its effects and consequences. Plans for assessing the outcomes should be presented in the proposal. Among the elements to be assessed, the following should be considered:

- Effects of project activities on the target audience (e.g., increased content knowledge, changes in pedagogical views and beliefs, increased enthusiasm for teaching, improved teaching practices, willingness to collaborate for improvement, or readiness and ability to provide leadership);
- Effects of outreach activities upon teacher participants, upon their peers, and upon students who are taught by teacher participants or by their outreach peers; and
- Effects of project activities upon participating institutions (e.g., strengthened course offerings or degree requirements, increased allocations of resources, greater provision of time and support for teacher development, or improved working relationships among internal and external partners).

The proposal should present plans for documenting the conduct of the project activities. A number of methods for documentation and examples of appropriate evidence are included in the subsection on Grant Administration and Final Project Report which follows. Informative documentation is especially important for projects in which model approaches are studied.

Proposers should note that projects for development of materials are subject to the following specific requirements:

- broadcasts, exhibits, and other materials must include a clear indication of the source(s) of support (both NSF and any other contributions) and should include the NSF logo;
- a copy of all materials developed (videotapes of programs, a teacher's guide, etc.) must be provided to the NSF;
- the U. S. Government must be provided a royalty-free license in perpetuity to use the materials for Government purposes;
- off-the-air recording rights by educational agencies or institutions shall be guaranteed for a minimum of three years following the first broadcast; and
- all television programs must have closed captions encoded on the master broadcast tape and all programs must be broadcast with closed captions.

Bibliography of Pertinent Literature

A succinct listing should be provided to indicate that proposers are familiar with the work of others that has bearing on the project's design, methods, aims, and content.

Appendices

Only items essential to understanding the proposed project should be submitted. These should be clearly labeled, paginated, and identified in the Table of Contents for easy reference. *The total number of pages for such items should not exceed the equivalent of 15 pages.* In addition, a *vita* (*at most 2 pages each*) identifying *relevant* activities and publications from the last five years should be submitted for each principal investigator and for other senior personnel who will perform major roles in the conduct of the project. *It is essential that length limitations on proposals be observed.* Reviewers and staff will not be responsible for reading materials that exceed these limits. In the event that the review of a proposal would be strengthened through the examination of non-print materials, such as computer software or videotaped exemplars, such items may be submitted. Proposers may wish to consult with program staff about such items prior to submitting the proposal, however.

Information about Principal Investigators/ Project Directors

See Appendix 7. ONE COPY ONLY of this sheet is to be clipped to the signature copy of the Cover Page; DO NOT attach this information sheet to any other copy of the proposal.

How and Where to Submit

Intergovernmental Review

Many states have elected to review proposals submitted to Federal agencies by prospective grantees from that state. Pursuant to Executive Order 12372 ["Intergovernmental Review of Federal Programs"] and the implementing NSF regulations [*Federal Register*, Volume 48, No. 123, June 24, 1983, pp. 29358-29366], the NSF has established a procedure for ensuring the review of proposals by states when applicable. Programs described in this announcement are eligible for review by electing states under E.O. 12372.

Proposers from states electing to review proposals must submit their proposals to the state's single point of contact [SPOC] for review prior to, or simultaneously with, submission to the NSF. [See Appendix 8 for a list of SPOC addresses for states electing to review.] No grant award will be made by the NSF unless the state has had an opportunity to review the proposal for a period not to exceed 60 days.

Questions relating to NSF's implementation of E.O. 12372 should be directed to the NSF Intergovernmental Review Officer at (202) 357-9496.

Proposal Submission

Proposal copies must be clear, readable print and should be stapled or firmly clipped in the upper left corner. Do not assemble under special cover or use other bindings.

Fifteen (15) complete copies of the formal proposal and three (3) additional copies of the Cover Sheet, Project Summary, and Data Sheet should be prepared and sent to:

Data Support Services Section (SEE/DTPE)
Room 223
National Science Foundation
1800 G Street, N.W.
Washington, D.C. 20550

Grant Administration and Final Project Report

NSF grants are administered in accord with the terms and conditions of NSF Form Letter 200, Grant General Conditions, copies of which may be requested from the NSF Forms and Publications Unit.

Because of the nature of some precollege projects, proposers may wish to familiarize themselves with NSF policy in two particular areas:

- Where educational materials are products of the project, the GRESE should be consulted with respect to inventions, software, copyrights, and income;
- Where elementary and secondary school students are to be involved in research or in the development of materials, awards are subject to the provisions of 42 U.S.C. 1869 (a) and (b) ["Myers Amendment" and "Dornan Amendment"]. The provisions of law require appropriate grantee coordination with parents, guardians, and school district officials.

The awardee is wholly responsible for the conduct of projects, including research, the development of materials, and the preparation of project results for publication. The Foundation does not assume responsibility for such findings or their interpretation, but expects an acknowledgement of support in all published materials resulting from funded projects.

At the conclusion of the project, the principal investigator is required to submit a Final Project Report to the Foundation. Such reports are of great importance because they are vehicles for informing the Foundation and the scientific and educational communities about project activities. Because of the strong emphasis that the Foundation places upon designing, testing, and evaluating models for teacher preparation and enhancement and for educational networks, the collection, analysis, interpretation, and presentation of project documents should be a major element of activity. The following three subsections indicate the sorts of information and evidence expected in the Final Project Report, and should aid a proposer in planning a project.

(*i*) *Summary Sheets*

A brief project summary on NSF Form 98A (Appendix 9).

A completed Data Sheet (Appendix 4), reflecting the actual conduct of the project.

(*ii*) *Narrative of the Report*

The narrative portion of the Final Report should not exceed 15 single-spaced pages [or 30 double-spaced pages]. It should restate the objectives identified in the original proposal and address each one, indicating the extent to which it was realized by the project. In short, the report should answer the following questions: What was accomplished? How was it done? How successful was it? In all cases, supporting documentation is expected. In some cases, the evidence may be statistical and quantitative; in other instances anecdotal information may be more relevant and reliable. The items listed below are examples of information that might appropriately be included in the Final Report:

- Most successful and least successful aspects of the project.
- Unanticipated outcomes, benefits, and difficulties.
- Features of the project most likely to have wide impact or be transferable.
- Summary of journals, diaries, or narrative evaluation statements by participants and staff.
- Summary of notes from observations of project activities (e.g., workshops, presentations and demonstrations, laboratory sessions, conferences, implementation lessons, outreach workshops, consultations, or interviews).
- Evidence of changes in behavior or attitude of participants, especially with respect to their teaching.
- Evidence of impact of the program on students of the participants.
- Evidence of support and collaboration with appropriate constituencies, agencies, and organizations.
- Summary of dissemination and outreach activities already undertaken.
- Summary of plans for dissemination, outreach, and continuation of project, including projected follow-up contact with participants and affected populations.

(*iii*) *Appendices*

Much of the documentation supporting the Final Report will be most conveniently presented in the form of appendices. Some examples follow.

- Materials generated by the project staff for participants and the conduct of the project (e.g., schedules of events, course outlines, examinations with grade distributions, laboratory exercises and experiments, demonstrations, software, and other instructional materials).
- Materials generated by the participants for their colleagues and their students (e.g., laboratory reports, demonstrations, software, and other instructional materials).

- Other project-related products, publications, or presentations.
- Videotapes of selected project activities, including, where appropriate, classroom use and dissemination of materials.
- Evaluation instruments, pre- and post-tests, attitude surveys, program evaluation questionnaires, etc.
- List of participants with school affiliations and subject and grade levels taught.

Inquiries

Questions about the Division's programs that are not addressed in this publication may be directed to the NSF staff by writing to:

Division of Teacher Preparation and Enhancement
Directorate for Science and Engineering Education
National Science Foundation
Washington, D.C. 20550

For telephone inquiries [area code: 202]

Division of Teacher Preparation and Enhancement (357-7073)
Teacher Preparation (357-7069)
Teacher Enhancement (357-7539)
Science and Mathematics Education Networks (357-7078)
Presidential Awards for Excellence in Science and Mathematics Teaching (357-7074)

Related Programs

Information on other NSF programs in science, mathematics, and engineering education may be obtained by contacting:

Division of Materials Development, Research and Informal Science Education (357-7452)
Research in Teaching and Learning (357-7425)
Applications of Advanced Technologies (357-7064)
Informal Science Education (357-7076)
Instructional Materials Development (357-7066)
Office of College Science Instrumentation (357-9644)
Office of Studies and Program Assessment (357-7425)
Division of Research Career Development (357-7536)
Graduate Fellowships (357-7856)
Minority Graduate Fellowships (357-7536)
NATO Postdoctoral Fellowships in Science (357-9466)
Advanced Institute Travel Awards (357-9466)
Presidential Young Investigator Awards (357-9466)

V. PROPOSAL EVALUATION

The National Science Foundation instructs its peer reviewers to evaluate proposals on the basis of the four general criteria below. Also indicated are factors to be considered for the evaluation of science and engineering education proposals. These are intended to amplify the general criteria, where appropriate.

1. *Intrinsic Merit.* This criterion is used to assess the likelihood that the project will lead to fundamental advances or have substantial impact on precollege mathematics, science, and technology education. With respect to this criterion, consider such factors as:

- *Need:* Has the proposer identified an important need, problem, or issue related to the improvement of elementary or secondary school science or mathematics? Has the proposer demonstrated knowledge of the area of concern that is pertinent, current, and complete? Have teachers and other project collaborators been involved in assessment of the needs on which the rationale is based? Are the special needs of women, minorities, and the physically-disabled recognized and addressed? Is the proposer knowledgeable about other efforts in similar fields or the same geographical region? Is there justification for any proposed use of educational resources from outside the region? Is NSF support necessary and clearly justified?
- *Rationale:* Are the project goals and objectives clear and relevant to the mission of the Foundation and of the Division of Teacher Preparation and Enhancement? Is a coherent rationale presented to support the proposed response to the identified need? Are the assumptions and expectations underlying the model cogently stated? Are factors clearly identified which are instrumental for achieving project goals?
- *Scientific and Educational Merit:* Is the scientific, mathematical, and technological content in the project activities or materials appropriate for the audience? Are significant developments in educational technology, teaching methods, curriculum materials, and research in teaching and learning incorporated into the project activities? Is the project innovative for the region served and likely to have widespread applicability?

2. *Performance Competence.* This criterion relates to the capability of the proposers, the soundness of the proposed

approach, and the adequacy of the resources available to carry out the project. Consider such factors as:

- *Plan:* Does the proposal articulate a well-formulated, realistic plan for approaching the identified problem or needs? Is the plan designed to accomplish the objectives? Have all the relevant persons (especially members of the target audience, such as science and mathematics teachers), organizations, and institutions been involved in the planning? Does the plan incorporate the expertise of master teachers (e.g., Presidential Awardees), researchers and educators in science and mathematics education, school administrators, and community leaders? Are necessary material resources identified? Is the plan integrated with other local and professional efforts to improve the quality of mathematics or science education? Is there a workable plan for continuation of the activity beyond NSF support?

- *Activities:* Are the expectations and details of the project activities clearly stated? Are the experiences resulting from the project activities likely to lead to the proposed improvements? Is the duration of project activities sufficient to achieve the expected results? For inservice teachers, are summer and/or academic year activities included as appropriate? Do project activities constitute a model program for achieving the desired improvements? Are the tasks to be performed by various project staff made clear? Where appropriate, are activities included for promoting effective educational practices with females, minorities, and the physically disabled?

- *Documenting and Assessing:* How will the project be assessed and documented? Are the plans for assessment related to the goals of the project? Will the results of formative assessments be used to alter and improve the conduct of the project? Is the project likely to generate new information or deeper understandings about effective ways to prepare teachers or to help teachers improve their classroom practices? What indicators of project effect are to be used, and how are these to be assessed? What types of documentation will be sought, and how will these be analyzed and interpreted to report to all interested persons what was planned, what actually occurred, and how effective it was?

- *Participants:* For inservice projects, are the criteria and procedures for participant recruitment and selection clear, fair and appropriate to the project? What specific plans or efforts have been made to include women, minorities, and the physically disabled in all aspects of the project and to address their special needs and concerns?

- *Personnel:* Does the Principal Investigator(s) have the knowledge and experience required to conduct this project? Is the proposed project staff well qualified in the areas of science, mathematics, or technology on which the project will focus? Are scientists, mathematicians or engineers included as appropriate? Are practicing leadership teachers, private sector or community experts, specialists in science and mathematics education, and school administrators included as appropriate? Does the project staff have the expertise to plan, conduct, assess and document the project activities?

- *Budget:* Are the project costs appropriate for the probable project outcomes? Are the requests for support of staff person-months reasonable and justified in terms of time-on-task requirements? Are participants, where allowable, provided with adequate stipends (up to $40 per day, $200 per week), subsistence, and travel monies? Does the budget explanation (coded to the Budget Summary form) present detailed justifications, including itemized cost-sharing for each project partner? Is a realistic funding plan proposed that will make the project self-sustaining when NSF funding terminates? Does the plan provide for a graduated phase-out of NSF funding? What evidence is there that the local and regional funding levels are attainable in the time allotted?

3. *Utility or Relevance of the Project.* This criterion is used to assess the likelihood that the project can contribute to meeting specific needs in precollege mathematics, science, and technology education. Consider such factors as:

- Impact: Does the project have potential for significantly strengthening the Nation's science and mathematics education? Will the project increase the teaching effectiveness of the participants? Does the project employ an innovative approach that will serve as a model for others with similar concerns? For inservice projects: Are follow-up activities clearly described? Are plans included for supporting, encouraging, and advising teacher participants as they begin to use their new knowledge? Is there evidence that cooperating school systems recognize that extra effort and time will be required to carry out academic-year project activities, and have therefore adjusted teachers' workload assignments accordingly? Have specific arrangements been made to provide appropriate opportunities for project participants to continue to work together? If appropriate, will outreach to nearby schools or school systems be undertaken?

- Products: Will the project result in quality products such as instructional materials, workshop plans and resources, program descriptions, course syllabi, teaching demonstrations, computing software, and items for documenting project events and reporting assessment results? Have effective plans been formulated for disseminating the results and products from this project?

4. *Effect on the Infrastructure of Science and Engineering.* This criterion relates to the potential of the proposed project to contribute to better understanding or improvement of the quality, distribution, or effectiveness of the Nation's scientific and engineering education, research, and human resources base. Consider such factors as:

- *Partnerships:* What collaborative arrangements for direct involvement in this project have been formed among local and state educational agencies, colleges and universities, the private sector, cultural institutions, professional societies, and others? Do the collaborations involve substantive interaction and support for the goals, design, and conduct of the project? Will the project encourage and facilitate improved, lasting working relationships among teachers and administrators of cooperating school systems, the scientists and educators of cooperating colleges, universities, cultural institutions, and industry, and other concerned citizens of the community?

- *Contributions:* Does the budget include appropriate cost-sharing contributions from the project partners? For multi-year projects does the profile of cost-sharing commitments include progressively greater contributions from the project partners as the percentage of funding from NSF is progressively decreased?

- *Balance:* Does the project specifically address the needs and potential of the diverse teacher and student population of the region or Nation including the gifted and talented, women, minorities, physically disabled, and the disadvantaged? Does it provide for those who are not preparing for careers in science, mathematics, or engineering as well as those who are? Do these efforts include specific project activities for dealing with these needs?

Proposals will be reviewed for scientific and educational merit by practicing scientists and mathematicians, science and mathematics educators, precollege teachers and administrators, and others having knowledge and expertise in the field(s) represented in the proposal. Until a decision is announced, no information can be provided on the probability of support. Every effort is made to reach a decision and inform the applicant promptly. Notification of an award is made in writing by the Division of Grants and Contracts of the Foundation. Organizations whose proposals are unsuccessful will be advised in writing as promptly as possible. Regardless of the proposal action, verbatim copies of the written reviews, not including the identities of the peer reviewers, will be sent automatically to the applicants.

APPENDIX 1

Checklist for Proposal Assembly and Submission

[ ] 1. Cover Page—NSF Form 1207 (Appendix 2)

Enter the appropriate program name. Starting date should be the anticipated date of initial project activities. Include all required signatures (principal investigator, co-principal investigator, and organizational representative).

[ ] 2. Table of Contents

[ ] 3. Project Summary (Appendix 3)

[ ] 4. Data Sheet (Appendix 4)

[ ] 5. Proposal Budget—NSF Form 1030 (Appendix 5)

If the project duration is longer than one year, there must be a cumulative budget for the full term, plus a budget for each year. Attach budget explanation sheets for each year.)

[ ] 6. Statement of Current and Pending Support (Appendix 6)

[ ] 7. Results from Prior NSF Support (when applicable)

[ ] 8. Project Description

Maximum number of pages: 15 single-spaced or 30 double-spaced, normal type-size on one side of each page, all copies readable)

[ ] 9. Bibliography of Pertinent Literature

[ ] 10. Proposal Appendices (Limit: 15 pages plus 2-page vitae)

[ ] 11. Information about Principal Investigators/Project Directors—NSF Form 1225 (Appendix 7)

One copy only, attached to the signature copy of the Cover Page.

[ ] 12. Fifteen (15) copies of the proposal, including the original signed copy, plus three (3) additional copies of the Cover Sheet, Project Summary, and Data Sheet.

[ ] 13. All proposal materials forwarded in a single package addressed to:

Data Support Services Section (SEE/DTPE)
National Science Foundation, Room 223
Washington, D.C. 20550

COVER SHEET FOR PROPOSALS TO THE NATIONAL SCIENCE FOUNDATION

FOR CONSIDERATION BY NSF ORGANIZATIONAL UNIT (Indicate the most specific unit known, i.e. program, division, etc.)	PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE

SUBMITTING INSTITUTION CODE (if known)	FOR RENEWAL ☐ CONTINUING AWARD ☐ ACCOMPLISHMENT BASED RENEWAL ☐ REQUEST, LIST PREVIOUS AWARD NO.:	IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? Yes____ No____ IF YES, LIST ACRONYM(S)

NAME OF SUBMITTING ORGANIZATION TO WHICH AWARD SHOULD BE MADE (INCLUDE BRANCH/CAMPUS/OTHER COMPONENTS)

ADDRESS OF ORGANIZATION (INCLUDE ZIP CODE)

IS SUBMITTING ORGANIZATION: ☐ For-Profit Organization; ☐ Small Business; ☐ Minority Business; ☐ Woman-Owned Business

TITLE OF PROPOSED PROJECT

REQUESTED AMOUNT	PROPOSED DURATION	DESIRED STARTING DATE

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW:

- ☐ Animal Welfare
- ☐ Endangered Species
- ☐ Human Subjects
- ☐ Marine Mammal Protection
- ☐ Pollution Control
- ☐ National Environmental Policy Act
- ☐ Research Involving Recombinant DNA Molecules
- ☐ Historical Sites
- ☐ Interdisciplinary
- ☐ International Cooperative Activity
- ☐ Research Opportunity Award
- ☐ Facilitation Award for Handicapped
- ☐ Proprietary and Privileged Information

PI/PD DEPARTMENT	PI/PD ORGANIZATION	PI/PD PHONE NO. & ELECTRONIC MAIL

PI/PD NAME/TITLE	SOCIAL SECURITY NO.*	HIGHEST DEGREE & YEAR	SIGNATURE
ADDITIONAL PI/PD (TYPED)			
ADDITIONAL PI/PD (TYPED)			
ADDITIONAL PI/PD (TYPED)			
ADDITIONAL PI/PD (TYPED)			

For NSF Use:

TO BE COMPLETED BY THE AUTHORIZED ORGANIZATIONAL REPRESENTATIVE. By signing and submitting this proposal, the prospective grantee is providing the certifications set forth in (1) *Grants for Research and Education in Science and Engineering*, NSF 83-57 (rev. 11/87), and (2) Appendix C, 45CFR 620, Subpart F (Requirements for a Drug-Free Workplace).

(If answering yes to either, please provide explanation.)	YES	NO
Is the organization delinquent on any Federal Debt?		
Is the organization presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?		

AUTHORIZED ORGANIZATIONAL REP.	SIGNATURE	DATE	TELEPHONE NO.
NAME/TITLE (TYPED)			
OTHER ENDORSEMENT (optional)			
NAME/TITLE (TYPED)			

*Submission of social security numbers is voluntary and will not affect the organization's eligibility for an award. However, they are an integral part of the NSF information system and assist in processing the proposal. SSN solicited under NSF Act of 1950, as amended.

APPENDIX 3

NATIONAL SCIENCE FOUNDATION

PROJECT SUMMARY

NSF AWARD NO.

FOR NSF USE ONLY			
DIRECTORATE/DIVISION	PROGRAM OR SECTION	PROPOSAL NO.	F.Y.

NAME OF INSTITUTION (INCLUDE BRANCH/CAMPUS AND SCHOOL OR DIVISION)
ADDRESS (INCLUDE DEPARTMENT)
PRINCIPAL INVESTIGATOR(S)
TITLE OF PROJECT
TECHNICAL ABSTRACT (LIMIT TO 22 PICA OR 18 ELITE TYPEWRITTEN LINES)

APPENDIX 4

DATA SHEET, DIVISION OF TEACHER PREPARATION AND ENHANCEMENT

Institution: _____ Starting Date: _____

Project Title: _____

PI Name: _____ Phone: _____

NSF Request: $_____ Non-NSF Cost Sharing: $_____ Duration: _____ mos.

Project Emphasis		Percent of Time	Level	Number of Participants
Content Areas	_____	_____%	Elementary	_____
(use codes	_____	_____%	Middle/Junior High	_____
from reverse)	_____	_____%	High School	_____
	_____	_____%	Other (specify)	_____
	_____	_____%	TOTAL	_____
	_____	_____%		
Teaching Methodology		_____%	Geographic Areas of Participants:	
Technology Applications		_____%	_____	
Materials Development		_____%	_____	
	TOTAL	100%	_____	

Special Emphases:	Project Activities	Participants	Target Students
Minorities	_____%	_____%	_____%
Women	_____%	_____%	_____%
Physically-Disabled	_____%	_____%	_____%
Gifted/Talented	_____%	XXXXX	_____%
Disadvantaged	_____%	XXXXX	_____%
Preservice Teachers	_____%	_____%	XXXXX
In-Service Teachers	_____%	_____%	XXXXX
Well-Prepared	_____%	_____%	XXXXX
Under-Prepared	_____%	_____%	XXXXX

FOR NSF USE ONLY

Proposal No. _____ Date Recd. _____ Program _____ Officer _____

Action: _____ with. _____ inelig. _____ decl. _____ aw'd. Action Date _____

Award Type: STD _____ 01(new) _____ 05(supp) CONT _____ 21(new) _____ 22(incr) _____ 25(supp)

Award $ _____ Dur: _____ mo. Outyear: $ _____ ___ $ _____ FY ___

INSTRUCTIONS FOR COMPLETING DATA SHEET

Project Emphasis

The term "Content Areas" refers to instruction or activities focusing primarily upon the content of a discipline (e.g., the phenomena, principles, or theory of chemistry). From the list of Content Areas below, select those categories that best represent the intended emphases of the project. Estimate the percentage of time that participants will devote to each area. In addition, estimate the percentage of time that will be devoted to Teaching Methodology (e.g., problem-solving strategies), Technology Applications (e.g., the use of the micro-computer), and Materials Development (e.g., teacher-developed teaching modules). To be sure, these categories may not be mutually exclusive, but make best estimates such that the percentages total 100.

Level and Area of Participants

Specify for each project year the number of participants teaching or otherwise involved at each of the indicated grade levels. Indicate the geographical area(s) from which you intend to select the participants.

Special Emphases

Estimate the time-percentage of project activities that will be devoted to addressing the needs of the indicated groups (Column 1). Also estimate the anticipated percentage of persons that will be members of the indicated groups (Columns 2 and 3). These will probably not total 100%. "Participants" are those persons that the project is designed to benefit directly (e.g., the elementary, middle, and/or secondary school teachers participating in an in-service workshop or the prospective teachers in a preservice program). "Target Students" are the precollege students who will benefit from subsequent interaction with the participants.

CODES FOR CONTENT AREAS

11 Astronomy
61 Biology
12 Chemistry
31 Computer Science
59 Engineering
49 Environmental Sciences
88 Geography
42 Geological Sciences
69 Life Sciences
21 Mathematics
DB Mathematics Education
13 Physics
79 Psychology
DD Science Education
89 Social Sciences
Other (Specify on Form)

(SEE INSTRUCTIONS ON REVERSE BEFORE COMPLETING)

APPENDIX 5
SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (MONTHS) Proposed	Granted
AWARD NO.		

ORGANIZATION

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR

A. SENIOR PERSONNEL: PI/PD, Co PI's, Faculty and Other Senior Associates (List each separately with title, A 6: show number in brackets)	NSF FUNDED PERSON MOS CAL	ACAD	SUMR	FUNDS REQUESTED BY PROPOSER	FUNDS GRANTED BY NSF (IF DIFFERENT)
1.				$	$
2.					
3.					
4.					
5. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
6. ( ) TOTAL SENIOR PERSONNEL (1-5)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. ( ) GRADUATE STUDENTS					
4. ( ) UNDERGRADUATE STUDENTS					
5. ( ) SECRETARIAL CLERICAL					
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A+B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)					
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $1,000.)					
TOTAL PERMANENT EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/PAGE CHARGES					
3. CONSULTANT SERVICES					
4. COMPUTER (ADPE) SERVICES					
5. SUBCONTRACTS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (SPECIFY)					
TOTAL INDIRECT COSTS					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPM 252 AND 253)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$	$

PI/PD TYPED NAME & SIGNATURE*	DATE	FOR NSF USE ONLY
		INDIRECT COST RATE VERIFICATION
INST. REP. TYPED NAME & SIGNATURE*	DATE	Date Checked / Date of Rate Sheet / Initials DGC / Program

NSF Form 1030 (1-87) *Supersedes All Previous Editions*

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPM 233)

INSTRUCTIONS FOR USE OF SUMMARY PROPOSAL BUDGET (NSF FORM 1030)

1. General

a. Each grant proposal, including requests for supplemental or incremental funding, must contain a Summary Proposal Budget in this format unless a pertinent program guideline specifically provides otherwise.

b. Copies of NSF Form 1030 and instructions should be reproduced locally as NSF will not supply the form.

c. A separate form should be completed for each year of support requested. An additional form showing the cumulative budget for the full term requested should be completed for proposals requesting more than one year's support. Identify each year's request (e.g., "First year _____," or "Cumulative Budget," etc.) in the margin at the top right of the form.

d. Completion of this summary does not eliminate the need to fully document and justify the amounts requested in each category. Such documentation should be provided on additional page(s) immediately following the budget in the proposal and should be identified by line item. The documentation page(s) should be titled "Budget Explanation Page."

e. If a revised budget is required by NSF, it must be signed and dated by the Authorized Organizational Representative and Principal Investigator and submitted in at least the original and two copies.

2. Budget Line Items

A full discussion of the budget and the allowability of selected items of cost is contained in *Grants for Research and Education in Science and Engineering, NSF Grant Policy Manual—GPM* (NSF 77-47 periodically revised), and other NSF program brochures and guidelines. Following is a brief outline of budget documentation requirements by line item. *(NOTE: All documentation or justification required on the line items below should be provided on the Budget Explanation Page.)*

A., B., and C. Salaries, Wages, and Fringe Benefits (GPM 511 and GPM 205.1). On the Budget Explanation Page, list individually all senior personnel who were grouped under A5, the requested person-months to be funded, and rates of pay.

D. Permanent Equipment (GPM 512 and 204.2). While items exceeding $500 and 2 years' useful life are defined as permanent equipment, it is only necessary to list item and dollar amount for each item exceeding $1,000. Fully justify.

E. Travel (GPM 514 and GPM 730). Address the type and extent of travel (including consultant travel) and its relation to the project. Itemize by destination and cost and justify travel outside the United States and its possessions, Puerto Rico, and Canada. Include dates of foreign visits or meetings. Fare allowances are limited to round-trip, jet-economy rates.

F. Participant Support Costs (GPM 518). Normally participant support may only be requested for grants supporting conferences, workshops or symposia. Consult *Grants for Research and Education in Science and Engineering* or specific program guidelines.

G. Other Direct Costs.

1. *Materials and Supplies* (GPM 513). Indicate types required and estimate costs.
2. *Publication Costs/Page Charges* (GPM 517). Estimate cost of preparing and publishing project results.
3. *Consultant Services* (GPM 516). Indicate name, daily compensation (limited to GS-18 daily rate), and estimated days of service, and justify.
4. *Computer Services* (GPM 515). Include justification based on established computer service rates at the proposing institution. Purchase of equipment is included under D.
5. *Subcontracts* (GPM 623 and Exh. V-1). Include a complete budget and justify details.
6. *Other*. Itemize and justify. Include computer equipment leasing.

I. Indirect Costs (GPM 530). Specify current rate(s) and base(s). Use current rate(s) negotiated with the cognizant Federal negotiating agency. See *GPM* for special policy regarding grants to individuals, travel grants, equipment grants, doctoral dissertation grants, and grants involving participant support costs (chap. V, GPM).

K. Residual Funds (GPM 253). For incremental funding requests on continuing grants, enter the amount estimated to be in *excess* of 10% at the planned amendment effective date. If less than 10%, indicate: "none." Residual funds should *not* be reflected in budget categories A-I. A justification for carryover of funds in excess of 10% is required.

L. Item L will be the same as Item J unless the Foundation disapproves the carryover of funds. If disapproved, Item L will equal J minus K.

APPLICANTS MUST NOT ALTER OR REARRANGE THE COST CATEGORIES AS THEY APPEAR ON THIS FORM, WHICH IS DESIGNED FOR COMPATIBILITY WITH DATA CAPTURE BY NSF'S MANAGEMENT INFORMATION SYSTEM. IMPROPER COMPLETION OF THIS FORM MAY RESULT IN RETURN OF PROPOSAL TO APPLICANT.

SUMMARY PROPOSAL BUDGET DEFINITIONS AND EXPLANATORY REMARKS

The *personnel categories* listed in part A and B of the summary are *defined* as follows.

A. *Senior Personnel*

1.-5. (Co) *Principal Investigator*(s) are individuals(s) so designated by the grantee institution.

A Faculty Associate (faculty member) is an individual—other than the Principal Investigator—who is considered by the performing institution to be a member of its faculty or who holds an appointment as a faculty member at another institution, and who will participate in the project being supported.

B. *Other personnel*

1. A *Postdoctoral Associate* is an individual who received a Ph.D., M.D., D.Sc., or equivalent degree less than 5 years ago, who is not a member of the faculty of the performing institution, and who is not reported under Senior Personnel above.

2. *Other Professional* is a person who may or may not hold a doctoral degree or its equivalent, who is considered professional and is not reported as a Principal Investigator, faculty associate, postdoctoral associate, or student. Examples of persons included in this category are doctoral associates not reported under B1 above, professional technicians, mathematicians, physicians, veterinarians, system experts, computer programmers, and design engineers.

A *Graduate Student* (Research assistant) is a part-time or full-time student working on the project in a research capacity who hold at least a bachelor's degree or its equivalent and is enrolled in a degree program leading to an advanced degree.

An Undergraduate Student is a student who is enrolled in a degree program (part-time or full-time) leading to a becahelor's degree.

5.&6. These include persons working on the project in a nonresearch capacity, such as secretaries, clerk-typists, draftsmen, animal caretakers, electricians, and custodial personnel, regardless of whether they hold a degree or are involved in degree work.

Any personnel category for which NSF funds are requested should indicate the number of different persons expected to receive some support from those funds, and, where called for on the budget format, the full-time equaivalent (FTE) person-months to the nearest tenth.

APPENDIX 6

STATEMENT OF CURRENT AND PENDING SUPPORT

A. THIS PROPOSAL

Investigator(s):

Source of funds: NSF

Project Title:

Amount requested:

Award period:

Percent of time devoted to project Summer:_____ Academic year:_____

Where work will be performed:

B. CURRENT AND OTHER PENDING SUPPORT

☐ Check this box if the principal investigator(s) have no current or other pending support.

If other support *is* current or pending, so indicate below.

Investigator:

Circle one: current pending

Source of funds*:

Project title:

Award amount:

Award period:

Percent of time devoted to project Summer:_____ Academic year:_____

Where work will be performed:

Investigator:

Circle one: current pending

Source of funds*:

Project title:

Award amount:

Award period:

Percent of time devoted to project Summer:_____ Academic year:_____

Where work will be performed:

*Include NSF, other Federal and State Agencies, and private sources outside the college or university.

Use additional pages if necessary.

APPENDIX 7

INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS

Submit only ONE copy of this form with your proposal. Attach it on top of the cover page of the copy of your proposal that bears the original signatures. Leave the back of the page blank. Do not include this form with any of the other copies of your proposal, as this may compromise the confidentiality of the information. Submission of this form is required before processing will be initiated.

Please check the appropriate answers to each question for all principal investigator(s)/project director(s) listed on the cover page, using the same order in which they were listed there:

	Principal Investigator/ Project Director	First Additional PI/PD	Second Additional PI/PD	Third Additional PI/PD	Fourth Additional PI/PD
1. Is this person:					
Female	☐	☐	☐	☐	☐
Male	☐	☐	☐	☐	☐
2. Is this person a U.S. citizen?					
Yes	☐	☐	☐	☐	☐
No	☐	☐	☐	☐	☐
3. Which one of these categories* best describes this person's ethnic/racial status? (If more than one category applies, use the category that most closely reflects the person's recognition in the community.)					
American Indian or Alaskan Native	☐	☐	☐	☐	☐
Asian or Pacific Islander	☐	☐	☐	☐	☐
Black, not of Hispanic Origin	☐	☐	☐	☐	☐
Hispanic	☐	☐	☐	☐	☐
White, not of Hispanic Origin	☐	☐	☐	☐	☐
4. Does this person have a handicap that limits a major life activity?					
Yes	☐	☐	☐	☐	☐
No	☐	☐	☐	☐	☐
Check here if this person does not wish to provide some or all of the above information	☐	☐	☐	☐	☐

* AMERICAN INDIAN OR ALASKAN NATIVE: A person having origins in any of the original peoples of North America, and who maintains cultural identification through tribal affiliation or community recognition.

ASIAN OR PACIFIC ISLANDER: A person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands. This area includes, for example, China, India, Japan, Korea, the Philippine Islands and Samoa.

BLACK, NOT OF HISPANIC ORIGIN: A person having origins in any of the black racial groups of Africa.

HISPANIC: A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race.

WHITE, NOT OF HISPANIC ORIGIN: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

WHY THIS INFORMATION IS BEING REQUESTED:

The National Science Foundation has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity or handicap of the proposed principal investigators and co-principal investigators. To gather the information needed for this important task, NSF requires that a single copy of this form be submitted with each proposal; however, submission of the requested information is not mandatory and is not a precondition of award. Any individual not wishing to submit the information should check the box provided for this purpose.

Information from this form will be retained by NSF as an integral part of its Privacy Act Records System, NSF-29, "Proposal and Award Information." These are confidential files accessible only to NSF personnel, and will be treated as confidential to the extent permitted by law. Data submitted will be used in accordance with criteria established by the National Science Board for the selection of projects, published in NSF 83-57, "Grants for Research and Education in Science and Engineering."

APPENDIX 8

INTERGOVERNMENTAL REVIEW OFFICES

This Appendix contains information concerning the Single Points of Contact (SPOC) in states that have elected to review eligible NSF DSEE programs. Reference: [Executive Order 12372, Intergovernmental Review, NSF Circular 170.] This summary has been revised through February 25, 1987. Additional or updated information may be obtained from:

NSF Intergovernmental Review Officer
Division of Grants and Contracts
National Science Foundation
Washington, D.C. 20550
(202) 357-9496

I. States That Have Elected NOT to Review Eligible NSF DSEE Programs

ALABAMA, ARIZONA, ARKANSAS, COLORADO, FLORIDA, GEORGIA, IDAHO, ILLINOIS, IOWA, KANSAS, MARYLAND, MINNESOTA, MONTANA, NEBRASKA, NEW YORK, NORTH CAROLINA, OREGON, RHODE ISLAND, TEXAS, UTAH, WEST VIRGINIA, WISCONSIN, PUERTO RICO.

NOTE: ALASKA and IDAHO have not established a State Process System under E. O. 12372.

II. SPOC Addresses of States That Have Elected to Review Eligible NSF DSEE Programs.

CALIFORNIA

Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(916) 323-7480

CONNECTICUT

Intergovernmental Review Coordinator
Comprehensive Planning Division
Office of Policy and Management
80 Washington Street
Hartford, CT 06106-4459
(203) 566-3410

DELAWARE

Executive Department
Thomas Collins Building
Dover, DE 19903
ATTN: Francine Booth
(302)736-4204

HAWAII

Mr. Roger Ulveling, Director
Department of Planning and
Economic Development
P.O. Box 2359
Honolulu, HI 96804
(808) 548-3085 or 548-3016

INDIANA

Ms. Peggy Boehm
Deputy Director
State Budget Agency
212 State House
Indianapolis, IN 46204
(317) 232-5602

KENTUCKY

Bob Leonard
Kentucky State Clearinghouse
2nd Flr., Capital Plaza Tower
Frankfort, KY 40601
(502) 564-2382

LOUISIANA

Mr. Colby S. LaPlace
Asst. Secretary and SPOC
Dept of Urban & Comm Affairs
Office of State Clearinghouse
P.O. Box 94455, Capitol Sta.
Baton Rouge, LA 70804
(504) 342-9790

MAINE

State Planning Office
Intergovernmental Review
Process/Hal Kimbal
State House Station #38
Augusta, ME 04333
(207) 289-3154

MASSACHUSETTS

Executive Office of Communities
and Development
ATTN: Beverly Boyle
100 Cambridge Street
Room 904
Boston, MA 02202
(617) 727-3253

MICHIGAN

Ms. Michelyn Pasteur, Director
Local Government Services
Michigan Department of Commerce
P.O. Box 30225
Lansing, MI 48909
(517) 373-3530

MISSISSIPPI

Office of Federal/State Programs
Department of Planning and Policy
2000 Walter Sillers Building
500 High Street
Jackson, MS 39202
[For information Contact:
Mr. Marlan Baucum
Dept. of Planning Policy]
(601)359-3150

MISSOURI

Lois Pohl, Coordinator
Missouri Federal Assistance
Clearinghouse
Office of Administration
Division of General Services
Post Office Box 809
Jefferson City, MO 65102
(314) 751-4834

NEVADA

Ms. Jean Ford, Director
Office of Community Services
Capital Complex
Carson City, NV 89710
[Corres./Ques. Contact:
John Walker
Clearinghouse Coordinator]
(702) 885-4420

NEW HAMPSHIRE

Mr. David G. Scott, Act. Dir.
New Hampshire Office of State
Planning
2-1/2 Beacon Street
Concord, NH 03301
(603) 271-2155

NEW JERSEY

Mr. Barry Skokowski, Director
Division of Local Government
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APPENDIX 9

NATIONAL SCIENCE FOUNDATION Washington, D.C. 20550	**FINAL PROJECT REPORT** NSF FORM 98A	
PLEASE READ INSTRUCTIONS ON REVERSE BEFORE COMPLETING		
PART I—PROJECT IDENTIFICATION INFORMATION		
1. Institution and Address	2. NSF Program	3. NSF Award Number
	4. Award Period From To	5. Cumulative Award Amount
6. Project Title		

PART II—SUMMARY OF COMPLETED PROJECT *(FOR PUBLIC USE)*

PART III—TECHNICAL INFORMATION *(FOR PROGRAM MANAGEMENT USES)*

1. ITEM *(Check appropriate blocks)*	NONE	ATTACHED	PREVIOUSLY FURNISHED	TO BE FURNISHED SEPARATELY TO PROGRAM	
				Check (✓)	Approx. Date
a. Abstracts of Theses					
b. Publication Citations					
c. Data on Scientific Collaborators					
d. Information on Inventions					
e. Technical Description of Project and Results					
f. Other *(specify)*					
2. Principal Investigator/Project Director Name *(Typed)*	3. Principal Investigator/Project Director Signature				4. Date

NSF Form 98A (1-87) Supersedes All Previous Editions

Form Approved OMB No. 3145-0058

INSTRUCTIONS FOR FINAL PROJECT REPORT
(NSF FORM 98A)

One copy of this report is due within 90 days after the expiration of the award. It should be submitted to the cognizant program officer in the NSF award letter at the following address:

National Science Foundation
ATTN: Program Officer
Division (Cognizant Division/Program)
1800 G Street, N.W.
Washington, D.C. 20550

INSTRUCTIONS FOR PART I

These identifying data items should be the same as on the award documents.

INSTRUCTIONS FOR PART II

The summary (about 200 words) must be self-contained and intelligible to a scientifically literate reader. Without restating the project title, it should begin with a topic sentence stating the project's major thesis. The summary should include, if pertinent to the project being described, the following items:

- The primary objectives and scope of the project.
- The techniques or approaches used (only to the degree necessary for comprehension).
- The findings and implications stated as concisely and informatively as possible.

NSF may disseminate the project report through the National Technical Information Service (NTIS) of the Department of Commerce. Authors should also be aware that the summary may be used to answer inquiries by nonscientists as to the nature and significance of the supported activity. Scientific jargon and abbreviations should be avoided.

INSTRUCTIONS FOR PART III

Items in Part III may, but need not, be submitted with this Final Project Report. Place a check mark in the appropriate block next to each item to indicate the status of your submission.

a. Self-explanatory.

b. For publications (published and planned) include title, journal or other reference, date, and authors. Provide two copies of any reprints as they become available.

c. Scientific Collaborators: provide a list of co-investigators, research assistants and others associated with the project. Include title or status, e.g. associate professor, graduate student, etc.

d. Briefly describe any inventions which resulted from the project and the status of pending patent applications, if any.

e. Provide a technical summary of the activities and results. The information supplied in proposals for further support, updated as necessary, may be used to fulfill this requirement.

f. Include any additional material, either specifically required in the award instrument (e.g. special technical reports or products such as films, books, studies) or which are considered to be useful to the Foundation.

PART IV - SUMMARY DATA ON PROJECT PERSONNEL

NSF Division _____

The data requested below will be used to develop a statistical profile on the personnel supported through NSF grants. The information on this part is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information provided will be treated as confidential and will be safeguarded in accordance with the provisions of the Privacy Act of 1974. NSF requires that a single copy of this part be submitted with each Final Project Report (NSF Form 98A); however, submission of the requested information is not mandatory and is not a precondition of future awards. If you do not wish to submit this information, please check this box ☐

Please enter the numbers of individuals supported under this NSF grant.
Do not enter information for individuals working less than 40 hours in any calendar year.

*U.S. Citizens/ Permanent Visa	PI's/PD's		Post-doctorals		Graduate Students		Under-graduates		Precollege Teachers		Others	
	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.
American Indian or Alaskan Native												
Asian or Pacific Islander												
Black, Not of Hispanic Origin												
Hispanic												
White, Not of Hispanic Origin												
Total U.S. Citizens												
Non U.S. Citizens												
Total U.S. & Non-U.S. ..												
Number of individuals who have a handicap that limits a major life activity.												

*Use the category that best describes person's ethnic/racial status. (If more than one category applies, use the one category that most closely reflects the person's recognition in the community.)

AMERICAN INDIAN OR ALASKAN NATIVE. A person having origins in any of the original peoples of North America, and who maintains cultural identification through tribal affiliation or community recognition.

ASIAN OR PACIFIC ISLANDER. A person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands. This area includes, for example, China, India, Japan, Korea, the Philippine Islands and Samoa.

BLACK, NOT OF HISPANIC ORIGIN. A person having origins in any of the black racial groups of Africa.

HISPANIC. A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race.

WHITE, NOT OF HISPANIC ORIGIN. A person having origins in any of the original peoples of Europe, North Africa or the Middle East.

THIS PART WILL BE PHYSICALLY SEPARATED FROM THE FINAL PROJECT REPORT AND USED AS A COMPUTER SOURCE DOCUMENT. DO NOT DUPLICATE IT ON THE REVERSE OF ANY OTHER PART OF THE FINAL REPORT.

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

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